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CE 210-001: Construction Materials & Procedures

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CE 210-001: CONSTRUCTION MATERIALS & PROCEDURES

Class Hours & partially synchronous online

Mon 11:00 am - 1:50 pm Colton Hall 416 (First Day of Classes Tuesday, September 01, 2020)

Office (300 Wilson Ave Newark) at (973) 817-9090 or fg4@njit.edu

REQUIRED TEXT

Halpin, Daniel W. and Senior, Bolivar A., Construction Management, 5th Edition Wiley, and ISBN: 9781119256809. This textbook is referred to as DH in the lecture readings and other references below.

OTHER REFERENCE

International Building Code (IBC 2018) and International Residential Code (IRC 2018) some of it supplements

Building Construction, M. Mehta, W. Scarborough, & D. Armpriest 3rd Edition Pearson

Construction Methods and Management by S.W., Nunnally, 6th edition

Other files are assigned electronically as supplemental readings and will be e-mailed or place on Canvas to class participants. These are denoted in course outline as Efiles.

Prerequisites: HSS 101, CIS 101

COURSE DESCRIPTION AND OBJECTIVES:

This course is a general comprehensive course on construction management and engineering in the Civil and Environmental Engineering Department at NJIT. It provides a broad understanding of the construction environment, the engineering and construction project management process and development process, with particular emphasis on planning, scheduling and cost management, which are key pillars of successful construction management. Also, the various tools and techniques and their interactions in the cost-effective development of constructed facilities, will be covered with practical illustrations and complemented by hands-on exercises and case studies.

LEARNING OUTCOMES

This course covers the environment, planning and management issues related to the modern approach of construction management. Using the cases and background materials, and methodologies covered, you should be able to:

- Analyze the feasibility of a construction project within resource constraints.
- Understand the basic structure of the construction industry, its environment, its various sectors and its overall relationship to the US and global economy.
- Devise the best organizational structure capable of carrying out the project.
- Understand engineering economic principles and apply the concepts of life-cycle management of a constructed project from the owner's perspective (feasibility, financing, rate of return, contract management, quality control).
- Define the role of the general contractor, and understand the perspective of the GC as a business (estimating, bidding, project financing, cash flow management, materials and operations management).
- Understand the components of modern Professional Construction Management, and its relationships to other project participants as a form of project delivery.

COURSE OUTLINE (Subject to updating throughout semester)

Week	Dates	Textbook/Reading	Assignment (*)	Topics
1	08 Sept	DH Chapters 1,2 AIA Docs e-mailed or hand-out	Assignment #1 Questions 2.1, 2.5 DH	Overview of Construction Industry; Development Cycle for Projects
2	14 Sept	DH Chapters 3, 4	Assignment #2 Questions 3.4, 3.11(refer to AIA Doc G702)	Development Cycle for Projects (cont.), Contracts
3	21 Sept	DH Chapters 5, 6	Assignment #3 4.13 and handout	Legal Aspects of Organizations; Impact of Taxes-Field Trip (1)
4	28 Sept	Chapter 6(cont.), & 14	Case: So St & Penn Ave Urban Renewal LLC Assignment #4 Handout	Depreciation of Assets Project PILOT
5	5 Oct	DH Chapter 11	Proforma Problem & FV PV Time Value Money	Quiz1/Mathematics of Money
6	12 Oct	DH Chapters 11, 12 & AIA Document G702	Future and Present Values; Annuities & sinking funds, Bonds	Present and Future Values; Proforma
7	19 Oct	DH Chapter 13	Problem Project Funding	Case Study NY Ave
8	26 Oct	DH Chapter 7 E-mail Nunnally book chapters	Assignment # 5 Problem 7.3, MS project WBS Model Hand out	Project Planning & Scheduling
9	2 Nov	Nunnally (cont.)	CPM scheduling Handout	Mid-Term/ scheduling
10	9 Nov	Nunnally (cont.)	Assignment # 6 CPM handout,	CPM Scheduling
11	16 Nov	Fast track case study South Street Urban Renewal	MS schedule & presentation with problems	Practical Case Studies- Newark & Elizabeth Projects
12	23 Nov	Nunnally E-mail 1926	Structural building Materials	Construction Materials
13	30 Nov	Handout, Nunnally IBC Codes	Structural building materials	Construction Materials and Properties; Building Systems
14	7 Dec Last class	Handout, Nunnally IBC Codes	Structural building materials	Construction Materials
15	14 Dec	No Class Extra Help	No Class Extra Help	Review any material
16	15 Dec	Finals week	TBD	Final cover entire semester

Reading day 1 & 2 Dec 11 & 14 - Final Exam Period begins: Dec 15. Ends Dec 21

OSHA & Ethics will be covered each week specific to the topics

Assignment sheet will be handed out in class and/or found in Moodle with due dates

*Actual Assignments may differ from list and can be changed by Instructor during Semester.

GRADING:

The overall term grade will be based on the following elements:

Paper/Project Case Study: 17.5%

Quiz 1: 10%

Homework: 20%

Class Participation/attendance: 10%

Mid-Term: 17.5%

Final: 25%

Field Trip Reports

Each student will submit two (2) reports, which can be 2 Parts of the same project on self-conducted field trips according to the following schedule:

1. Project Administration: In this first part, you will establish a construction project of your choice, or a section of the class field trip project:
 - a- The project background, scope, budget, staging and key milestones.
 - b- Understanding of the contract and project delivery system, relationships between parties, progress measurement/payment, change order management.
 - c- Description of the Construction Methods and Materials, and an engineering evaluation of a key project component (e.g. foundation design, etc.)
 - d- A Preliminary Work Breakdown Structure.Part 1 is due **October 19** hand in at the beginning of class.
2. Project Planning and Code evaluation, including:
 - a- A detailed Work Breakdown Structure for all building systems and work elements **or a building code evaluation used on site.**
 - b- An MS Project CPM Schedule integrated with a cost estimate to enable cost/schedule integration.Part 2 is due **December 7** hand in at the beginning of class

Outline and Content Elements for Each (Part of) the Field Trip Reports:

1. *Introduction:* Identify the project, its location and the type of construction. Give the dates of your visitation. Identify the Owner, Contractor, and Architect-Engineer.
2. *Field Investigation:* Describe the project in detail based on your field visitation. Report on the present stage of construction. Report on the labor, equipment, and materials on the job. Report on production rates. Report any discussions with personnel (see note below).
3. *Engineering Evaluation:* Present your own evaluation of the equipment, materials, and procedures being used on the project based on your knowledge from CE 210. Suggest alternatives that might improve job progress and efficiency. Discuss any environmental and safety aspects of the project.

4. *Appendix:* (If any) Present applicable codes, manufacturer's literature, news articles, web links, etc.
5. *Figures and Photographs:* These or sketches are strongly recommended. Refer to all figures and photos in the body of the report.

Note: Make certain that you do not disrupt the ongoing construction activities during your visit. Always check first with the person-in-charge, usually the project superintendent, upon your arrival. Be courteous and remember, construction managers are busy people.

Report Format and Grading: The report should be word processed on 8.5 x 11 in. bond paper and handed in on dates specified. Correct grammar and spelling are required. Grading will be based on (1) Technical content, (2) Communication effectiveness including organization, grammar, spelling, clarity, and neatness. Suggested length of the text portion of each of the 2 Parts of the report is at least 4 pages.

NJIT Honor Code: the NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students.

- *“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:
<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.*

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our Program Educational Objectives are reflected in the achievements of our recent alumni:

1. Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward safe, practical, sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. Professional Growth: Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.
3. Service: Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Course Objectives Matrix – CE 210 Construction Materials and Procedures

Strategies and Actions	Student Learning Objectives	Student Outcomes (a-k)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: Develop an understanding of terms used to describe construction materials, methods and procedures used in heavy building construction, and construction management and organization.				
Introduce the United States system of delivery of engineering and construction services.	Students will become familiar with owner, engineer, contractor organization and project responsibilities.	f	1, 2, 3	Homework, quizzes, and exams.
Introduce equipment, labor and methods used in heavy and building construction.	Students will become familiar with equipment, labor and methods used on construction projects.	k	1	Homework, quizzes, and exams.
Introduce technology and standards used for basic construction materials.	Students will learn about the basic of construction materials.	a, e	1	Homework, quizzes, and exams.
Course Objective 2: Learn the process of job site planning, scheduling and construction productivity estimating.				
Introduce critical path method scheduling.	Students will learn the basics of critical path methods scheduling and job site planning.	a, e	1	Homework, quizzes, and exams.
Introduce methods used to calculate and estimate excavation equipment productivity.	Students will learn the basics of estimating excavation equipment productivity.	a, e	1	Homework, quizzes and exams.
Course Objective 3: Introduce construction contracts in the context of the United States legal system.				
Introduce the United States legal system and contracts.	Students will become familiar with the United States legal system and contracts.	f	1, 2, 3	Homework, quizzes, and exams.
Present the NCEES model rules of professional conduct.	Students will learn the rules of engineering ethics.	f	1, 2, 3	Homework, quizzes, and exams.

Introduce the role of OSHA and construction site safety.	Students will be aware of the role of OSHA and site safety on construction projects.	f	1, 2, 3	Homework, quizzes, and exams.
Course Objective 4: Observe and report on construction project site visits.				
Visit construction sites and observe the project status and operations at the site.	Students will learn how to write a construction site visit report which covers methods, materials, labor, equipment, safety, and environmental concerns.	g, h, j	1, 2	Field reports.
Introduce engineering economics and its role in selection of alternatives.	Students will learn the basics of engineering economics.	k	1, 2	Homework, quizzes and exams.